DATAMATION 84

NOVEMBER 15

BRANCH OFFICE MICROCOMPUTING

ALSO

MINI-MICRO SURVEY
BUSINESS GRAPHICS TRENDS
THE KING OF MALAPUTA

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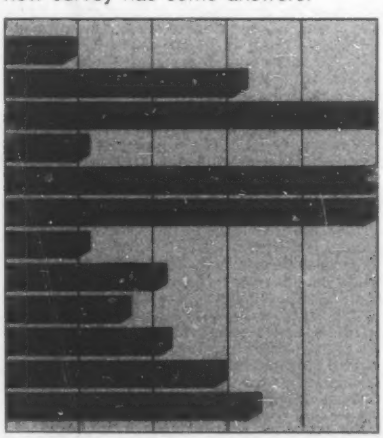

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IN FOCUS

UPSTARTS OUTSHINE THE STARS

The personal computer, in its many guises, is taking most of the glory away from traditional minicomputers.

by John W. Verity

Driven by strengthening user interest in office systems and workstations, the personal computer continues to gain importance at the expense of the traditional minicomputer. More than ever, new applications are being written for micros rather than minis. What's more, the IBM PC has apparently become the main element of that company's low-end business, working as a strategic vehicle for gaining new customers for all product lines.

These and other important trends were revealed in the 1984-85 Mini/Microcomputer Survey conducted last July by the stock brokerage firm Cowen & Co., Boston, in conjunction with DATAMATION. The survey is based on 6,264 unduplicated responses from individual user sites in the U.S., who reported a total of 26,778 minicomputers installed. As with previous surveys in this series, the respondent population is weighted heavily toward user sites where mainframes are installed. Almost nine out of 10 respondents, moreover, were end users, as opposed to oem/system resellers.

Among the special issues focused upon this year were the emergence of AT&T as a minicomputer and personal computer supplier, the use of local networks, and corporate use of personal computer software products. Additionally, measurements were made of users' loyalty to prime vendors, future spending on processors and peripherals, and their interest in the Unix operating system.

New users of small computers are increasingly choosing micros as their entry vehicles to the small systems market, which is not surprising, given the recent boom in personal computer manufacturing and marketing. The usage of workstations, measured explicitly for the first time in this year's survey, also took away from minicomputer growth. Whereas five years ago the eight-year compound annual growth rate for minicomputer shipments was measured at 23%, this year it stayed at the same 16% level as last year.

The two vendors showing the strongest growth in terms of purchases by users new to the mini industry were Apollo Computer Inc., Chelmsford, Mass., maker of engineering workstations, and Altos Computer Systems, San Jose, Calif., which makes microcomputers. In terms of new users of small systems, the office systems and workstations categories showed the most pronounced growth, while the rate for traditional minis dropped once again.

Despite the incursion of the personal computer, however, minicomputer shipments during the year ending June 1985 should grow by 25% in dollar terms compared with the previous year. This is almost double the comparable figure recorded in last year's survey, 13.9%, and is attributable mainly to strength in the oem/systems house segment of the market. (These figures are adjusted for new user expansion of the marketplace.) Growth prospects for individual suppliers relative to the overall average are a function of product positioning within the industry. Thus, traditional minicomputer suppliers will see only nominal shipment growth, small business systems suppliers a 21% rate, office systems vendors 34%, and workstation manufacturers 110%.

Personal computers, of course, will far outpace the minicomputer in terms of near-term growth: pcs should enjoy a rise in dollar shipments of 63% for the year ending June 1985, Cowen says. In fact, in the context of the survey, pcs will account for 32% of the dollars spent on small systems by respondents from July 1984 through June 1985, compared with 27% recorded for the same period a year earlier.

The eight-year compound growth rate of minicomputer shipments has stayed at the 16% level.

Looking further ahead, however, to the 12 months ending June 1986, a rising percentage of respondents indicated that their minicomputer spending would probably be less than during the previous year. That fits a general long-term pattern of moderating minicomputer shipment growth foreseen in the past several years. The slowdown is most pronounced at the high end of the minicomputer spectrum but is partially made up for in the low end, where workstation and personal computer business will be far more upbeat. For instance, three times as many respondents are planning to spend more rather than less on personal computer purchases in the 1985-86 period.

The rate of new sites joining the ranks of personal computer users dropped off dramatically, showing only 55% growth this year compared with 130% the year before, but it is still a substantial source of new business for vendors, given the fact that many more

SCENE FROM "ALL ABOUT EVE"/PHOTOTEQUE

billions of dollars are now involved. Apple Computer and Tandy Corp., two early entrants in the pc business, showed new user growth rates markedly lower than later arrivals like IBM and DEC. In the corporate marketplace, IBM has established a commanding lead of 58.4% of first-time users, compared with Apple's 7.4% and DEC's 8.1%. Just two years ago, Apple's share of new users was 26.7%.

Once again, those respondents buying pcs are turning more often than not to centralized control of their buying processes. Among organizations whose annual revenues exceeded $250 million, for instance, almost 70% said they centralized purchase of pcs. Among those same respondents, 45% buy direct from the manufacturer and 45% buy from independent computer stores.

In terms of sites, the independent store is the primary channel of distribution to respondents, but in terms of units purchased, the leading channel is direct from a vendor. Sales through independent stores were heaviest for portables from Compaq Computer Corp., Houston. Independent stores also figured heavily in hardware maintenance, particularly in the Apple and IBM-compatible segments of the market.

While the reselling of personal computers was present at only 9.4% of all responding sites, sites whose primary suppliers were Texas Instruments and Data General showed particularly heavy activity, an indication that TI and DG are focusing their attention on the value-added reseller and oem channels rather than on the more difficult direct confrontation with IBM and Apple.

As in surveys past, the availability of quality software is by far the most important criterion cited by respondents in choosing a personal computer vendor. Following that are the issues of compatibility (a close second), product reputation, price, ease of learning, and memory capacity.

Pc software purchases continue to be limited largely to a small number of popular packages. The 1-2-3 integrated spreadsheet and database from Lotus Development Corp., Cambridge, holds a commanding lead in popularity among users of IBM PC-type equipment, followed by Wordstar, dBase II, and VisiCalc, in that order. For the most part, users tend to rank the quality of packaged pc software above that available for their minicomputers. The ranking of types of applications run by users—word processing, spreadsheets, etc.—are relatively consistent across all major vendors' lines. Except in the case of DEC, whose users spend more time on word processing, spreadsheets are the leading application, followed by word processing, remote ter-

minal emulation, database management, and graphics.

The heaviest actual use of the personal computer was found in educational sites, where approximately 6.1 hours a day were put in on each machine. The average across all pc sites was 4.8 hours a day. The educational market continues to grow, with an average of 29 machines purchased at each such site (the overall average was 16 machines per site). Apple seems to have lost its lead in the educational sector in this survey population, showing a 28% share compared with IBM's 38%.

One of the most notable trends seen in the low-end computer marketplace is the ground swell of standardization on the IBM PC and work-alike

Workstation suppliers are among the most vulnerable to user defections from their customer bases.

products. No matter which vendor is cited by users as their primary minicomputer supplier, they more often than not list IBM as the primary supplier of personal computing equipment. In the context of the survey, in fact, IBM is on the verge of achieving a majority of market share for sites with PCs installed, Cowen reports. The company shows a 48.7% share of those sites, followed by Apple with 13.4%, DEC with 5.9%, Compaq with 4.7%, Hewlett-Packard with 4.1%, and Tandy with 4.2%. Just three years ago, Apple's share of the sites was 42% and Tandy's 26.1%.

As for machines planned to be purchased through the end of next year, IBM was cited as the primary supplier at 55% of the sites, followed by Apple at 8% and DEC at 7%. In a related development, DEC and Data General's pc sales seem to go mostly to their installed customer base. Whereas IBM will ship 64.5% of its PCs to respondents who don't use its minis, DEC's and DG's comparable figures are only 7.5% and 7.7%, respectively.

Apple has apparently done well with its Macintosh product. Of those 1983-84 Apple computer purchases mentioned by respondents, 42% of the units were Macs and 34% Apple II class machines. Those two models account for 55% and 29%, respectively, of units planned to be purchased through the end of 1985. The more expensive Lisa machine, however, shows a small and shrinking importance in Apple user buying plans.

Turning to minicomputers, the survey found that the mix of technical vs. business/commercial applications on minicomputers is a source of continuing strength for Digital Equipment Corp., the

FIG. 1

TOP DOZEN MINICOMPUTER SYSTEMS 1984/85

A. BASED ON NUMBER OF RESPONDENTS ACQUIRING SYSTEMS (7/84–12/85)

MANUFACTURER	SYSTEM	HOW MANY SITES ACQUIRING	AV. UNITS/ SITE
DEC	VAX-11/750	181	1.5
IBM	System/36	173	2.6
DEC	VAX-11/780	131	1.4
DEC	VAX-Unspecified	80	5.9
IBM	Series/1	70	3.3
DEC	VAX-11/785	65	1.6
HP	3000-Unspecified	57	1.6
DEC	PDP-11/44	40	1.5
IBM	System/38	40	1.1
HP	3000/68	37	1.1
DEC	PDP-11/23, 23-Plus	31	9.4
DG, DEC	MV/4000; VAX-11/730	30 each	4.0, 1.7

B. BASED ON NUMBER OF UNITS BEING ACQUIRED (7/84–12/85)

MANUFACTURER	SYSTEM	HOW MANY UNITS BEING ACQUIRED	EST. VALUE ($ MILLIONS)
Apollo	Unspecified	3,621	$181.4
DEC	VAX, Unspecified	469	52.6
IBM	System/36	451	27.7
Burroughs	B20/B25	366	2.7
Data General	Eclipse, Unspecified	308	40.7
DEC	PDP-11/23	292	4.1
DEC	VAX-11/750	275	40.5
NCR	Tower	273	3.8
IBM	Series/1	230	16.3
DEC	PDP-11/73, 78	184	1.7
Honeywell	DPS-6, Unspecified	184	14.3
DEC	VAX-11/780	181	60.5

FIG. 2

INDUSTRY PRICING TRENDS

Query: How big a price concession (above and beyond any normal quantity discount) did you receive when acquiring your last minicomputer system(s)?

FIG. 3

MINICOMPUTER SELECTION CRITERIA

Query: Which of the following factors were most important in your choice of a mini vendor?

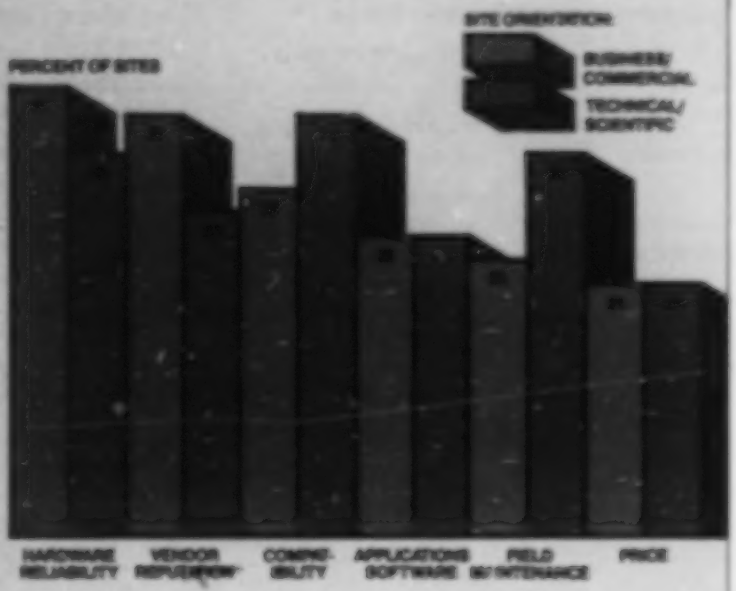
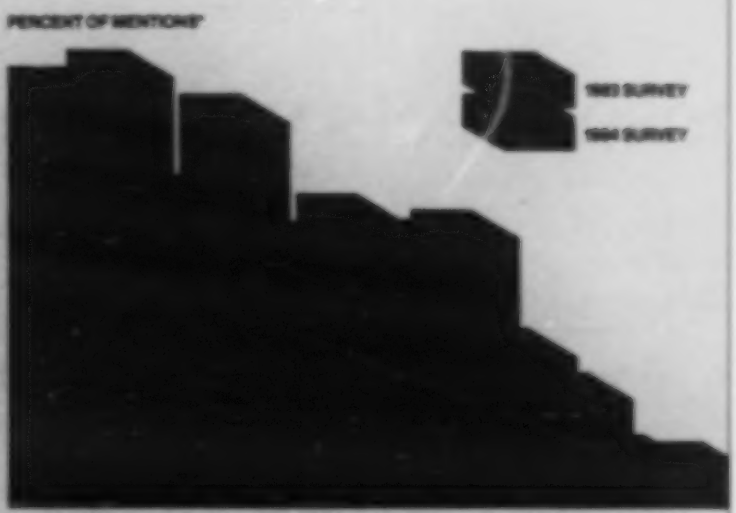


FIG. 4

PC SELECTION CRITERIA



*Each respondent asked to specify no more than three criteria.

leading mini supplier, in technical markets. This connotes, however, a disappointing showing by DEC in the faster-growing commercial mini market: the Maynard, Mass., company showed little if any additional penetration of the commercial sector and it continued to rank below the industry average in several subcategories. DEC's business continues, moreover, to be strongly dominated by minicomputers and not by the faster-growing personal computer.

AT&T, which formally entered the merchant minicomputer market this year, was found to have its strongest market penetration in shops doing software development systems, which follows from the Unix orientation of its hardware. It also showed strongly in education and timesharing markets.

When asked about the availability and quality of minicomputer applications software packages, DEC and Hewlett-Packard were most highly rated by respondents; Perkin-Elmer and Sperry were lowest.

As in the past four surveys, hardware reliability was named by users as the most important factor in choosing a minicomputer. This was especially true in commercial and business-oriented users. Technical and scientific sites were more likely to name field support and prior systems compatibility as the key factors. Other factors taken into consideration were vendor reputation, availability of applications software, and pricing. Users of IBM minis most often cited vendor reputation as the main criterion in their choice, while those using AT&T's 3B machines found the machines' strength in Unix most important. Wang Labs scored high with users looking for a "full systems line."

Tandem and Apollo users are most heavily into networking.

Asked over the years if they expected to change primary vendors of minicomputers, about four fifths of the respondents have said no. This year was no exception: 83.9% said no, 7.3% said yes, and 8.8% (down from as much as 11.3% in previous years) said they were seriously considering a switch. The vendors most likely to see users leave their fold, according to the survey, are Basic Four, Datapoint, and Four-Phase.

IBM and DP seem to have the highest loyalty among users, with only 9.1% of their users planning or considering a switch. Tandem Computers Inc., Cupertino, Calif., however, this year showed 14.3% of its users planning a switch, up dramatically from the 5.9% figure in last year's survey and a 0.0% rating in 1981. Also vulnerable, according to this year's

survey, are workstation supplier Apollo Computers and microcomputer vendor Altos, with 33.3% and 40%, respectively.

Software support, or the lack thereof, was cited most often by end users as the reason for considering a switch of vendor, while oem/systems house respondents cited faults in the vendor's sales and service organization.

The past trend toward single-supplier procurements has seen a reversal, suggesting a reintensifying of competition in the small business and office systems market segments. In other market segments, however—namely, traditional minis and intelligent terminals—more single-source procurements indicate a consolidation favoring established suppliers. Respondents indicated they enjoyed discounts from vendors when they were able to call in more than one supplier on a procurement.

Users rated Hewlett-Packard and DEC highest for availability of quality applications software.

A key measure of industry performance in the mini and personal computer markets is the purchasing plans users have for peripherals. This year's survey found 20mb to 100mb hard disks and tape drives to be the most active peripherals segments in terms of planned shipments. Disk storage capacities were found to be growing at better than 30% a year on a six-year compound basis. The average attached minicomputer disk storage is 344mb, compared to 275mb last year. Tandem cpus are equipped with the most disk storage, over 1GB, at the time of shipment. In the tape drive arena, Cipher Data Products, San Diego, will enjoy a 21.4% share of planned purchases for the 18 months ending December 1985.

Main memory for minicomputers among survey respondents has grown even faster than disk, at over 50% a year on a six-year compound basis. The average main memory size of minicomputers is now 1.396mb, compared with 950KB last year. This obviously reflects the continuing drop in semiconductor memory prices. Tandem machines are shipped with the most main memory, some 4.9MB.

Growth of main memory on personal computers is even sharper, hitting 61% on a four-year basis, compared to a 45%, four-year rate for minis. The average pc is shipped with 287KB of main storage, compared to 196KB last year. It seems safe to say that growth in this segment will be even stronger now that more powerful micros are coming into the market, and many vendors are now bundling 256KB as a minimum configuration for their pcs.

Looking at minicomputers that re-

FIG. 5

NEW CORPORATE PC USERS CHOOSE IBM

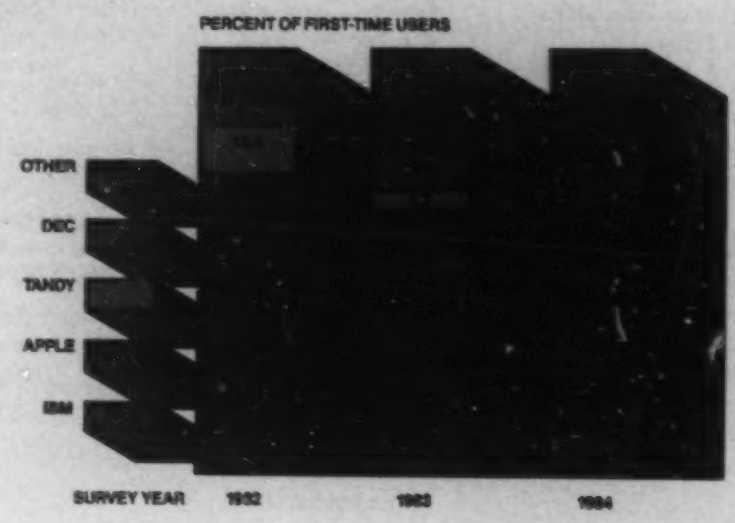
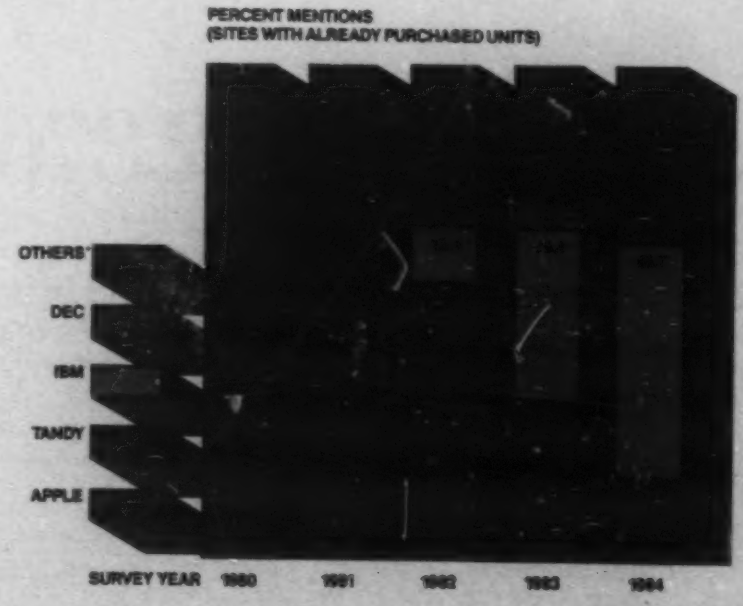


FIG. 6

IBM PC LEAD STRENGTHENING



*Included in "Others": Compaq 4.7%, HP 4.1%, Wang 2.3%, Zenith 1.4%, Kaypro 1.2%, TI 1.2%, Commodore 1.1%, etc. (five rest all less than 1%)

spondents reported having purchased during the past 18 months, the survey found some interesting patterns in price discounting. Price cuts were much more severe among the oem/systems house side of the market than among end users. The former received an average discount of 18.8% (above and beyond normal quantity discounts), while end users received only 10.7% breaks on the average. Altos came out as the heaviest discounter, offering an average of 57.1% off "normal" list prices. It was followed by Gould/SEL, Fort Lauderdale, (42.9%) and Convergent Technologies, Santa Clara, (40%). IBM and Tandem were the least likely to discount their machines.

Based on the number of sites that acquired a particular machine during 1983-84, DEC's VAX-11/750 was the most popular minicomputer: it was acquired by 232 sites, followed by IBM's System/36, which was acquired by 217 sites. Based on the number of machines acquired, Apollo earned the top spot with its Domain system, of which 1,411 units were acquired during the period.

With an eye to the next 18 months, oems and systems houses estimated their average on-hand supply of hardware was good for about 3.6 months, compared to the 2.8-month figure reported last year. That change may mean an eventual cooling off of order trends among these respondents. So far, however, few order delays or cancellations have been seen.

The most popular machine to be acquired by respondents in the coming 18 months should be the DEC VAX 11/750, which is in the purchasing plans of 181

Respondents cite the availability of quality software as the most important criterion in choosing a personal computer vendor.

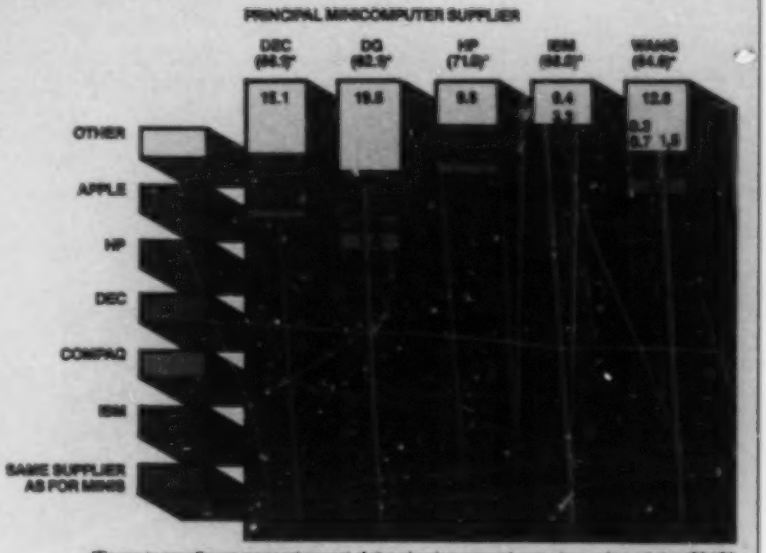
sites, followed by IBM's System/36, being acquired by 173 sites. Based on the number of units being acquired during the same period, the Apollo workstation is the most popular—including one particularly large order calling for 3,621. The runner-up is the DEC VAX, with 925 machines of various models to be installed.

Digital Equipment still relies heavily on the VAX family of 32-bit processors, but the stage appears set for a sweeping product cycle transition. Industry watchers generally expect new VAX models to begin appearing this month or next, particularly the long-awaited Venus, which would top off the line. In fact, survey respondents indicated that 5.5% of their planned purchases of DEC equipment would be for the Venus model, compared to 22% for the model 11/785, 35% for the 11/780, and 23% for the 11/750.

FIG. 7

IBM PC STRENGTH AT MINI SITES

WHOSE PC(S) PLANNED FOR PURCHASE IN 1984/85

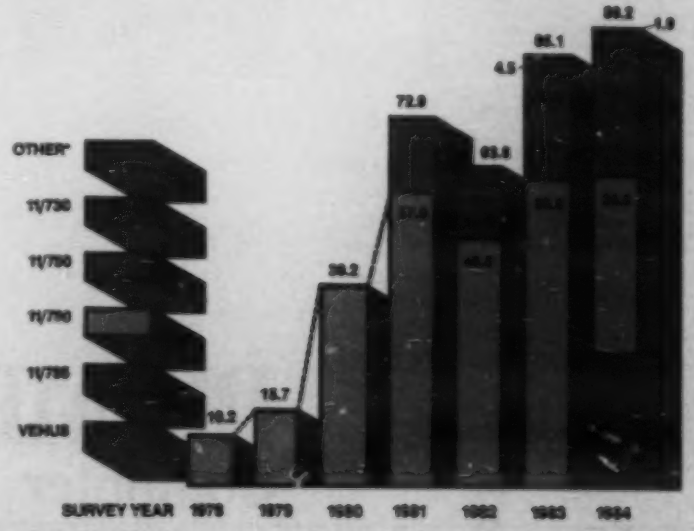


*Figures in parentheses represent percent of sites planning personal computer purchase during 1984/85

FIG. 8

VAX-11/780 STILL IMPORTANT TO DEC

VAX AS A PERCENTAGE OF PLANNED DEC SHIPMENTS (DOLLARS)



*II/725, MicroVAX

A decline in 11/780 installations is apparently being offset by rising 11/785 shipments.

Interestingly, Data General's standing in the overall minicomputer market seems to be on the rise. Whereas in the previous 18 months its hardware accounted for only 10.4% of the respondents' total spending on minicomputers, it expects to capture 12.4% of their dollars in the following 18 months. The warm reception given its line of 32-bit minis may be enough for it to gain market share from archrival DEC. Data General users indicated a planned increase in orders of MV/10000 32-bit machines at the expense of the MV/8000, while the MV/6000 has dropped almost completely out of the picture.

At Prime Computer, a sharp falloff in shipments of the models 550, 750,

IBM and HP seem to have the highest loyalty among users.

and 850 was foreseen, but those machines have been superceded by the 2250, 2550, 9750, and 9950. Prime users said they would spend 44% of their budgets through the end of next year on the 9950 and 21% on the 750.

The use of AT&T's up-and-coming Unix operating system was found to be growing quickly, albeit from a small installed base. Only 7.6% of the respondents, most of them in the technical/scientific sector, said they were using Unix as their primary operating system at the time of the survey, but another 6.2% said they would have it installed by the end of next year. By that time, also, 18.2% of the respondents said Unix would have at least secondary status at their sites. Among those using Unix as the primary operating system, those sites involved in so-called artificial intelligence, communication, and CAD/CAM were the heaviest users of Unix. Over half the primary Unix sites said they used the software on DEC hardware, but by next year substantial showings were expected on IBM, HP, and even Wang computers.

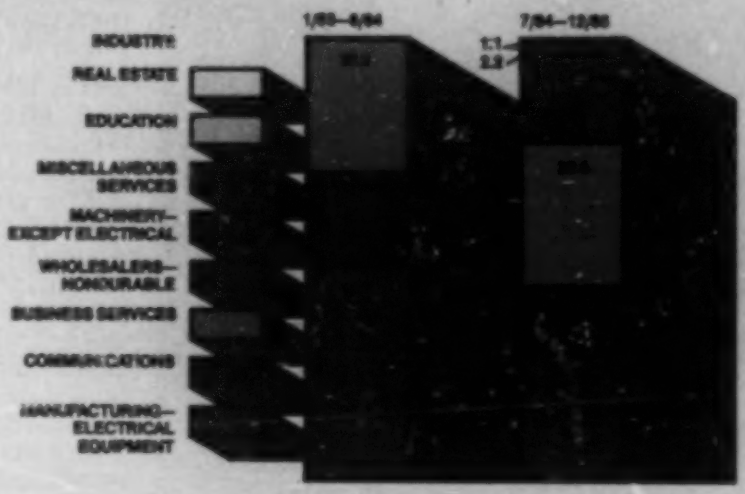
Use of remote minicomputer networks will grow substantially this year among respondents, 30% of which have such facilities installed and 18% of which will be making their first installations in the coming 18 months. And, as might be expected from the nature of their hardware, Tandem and Apollo showed top rankings in the usage of remote and local area networks, respectively.

Asked who their local area network suppliers were, respondents indicated that Ethernet was leading the pack, with 25% of the current and 44.5% of the planned installations, followed by Wangnet and DECnet. Interestingly, the local

FIG. 9

AT&T 3B SERIES SHIPMENTS

DISTRIBUTION OF 3B PURCHASES BY INDUSTRY



*Manufacturing—Electrical Equipment SIC includes old Western Electric

†Communications SIC includes the old Bell Operating Companies

‡Business Services includes computer and data processing service (ie., much of systems house population)

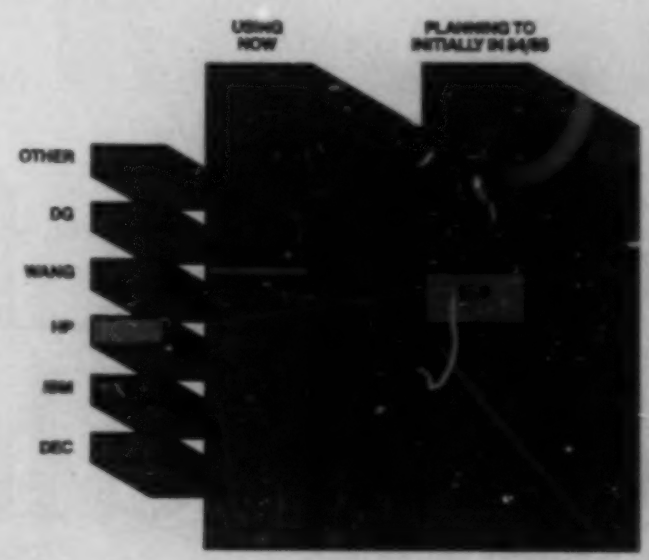
§Machinery—except Electrical includes office machine suppliers (eg., hardware comp)

FIG. 10

UNIX USAGE BIG ON DEC SYSTEMS

Query: What if any plans do you have for the use of Unix (Ultrix, Xenix, etc) as your primary or secondary operating system?

PERCENT OF SITES ANSWERING "PRIMARY"



"STUDENTS WITH THE LEAST MONEY OFTEN HAVE THE MOST AMBITION."

CHARLES L. BROWN,
CHAIRMAN, AT&T

"What do you do if your dream is to go to college but your family earns less than $12,000 a year?

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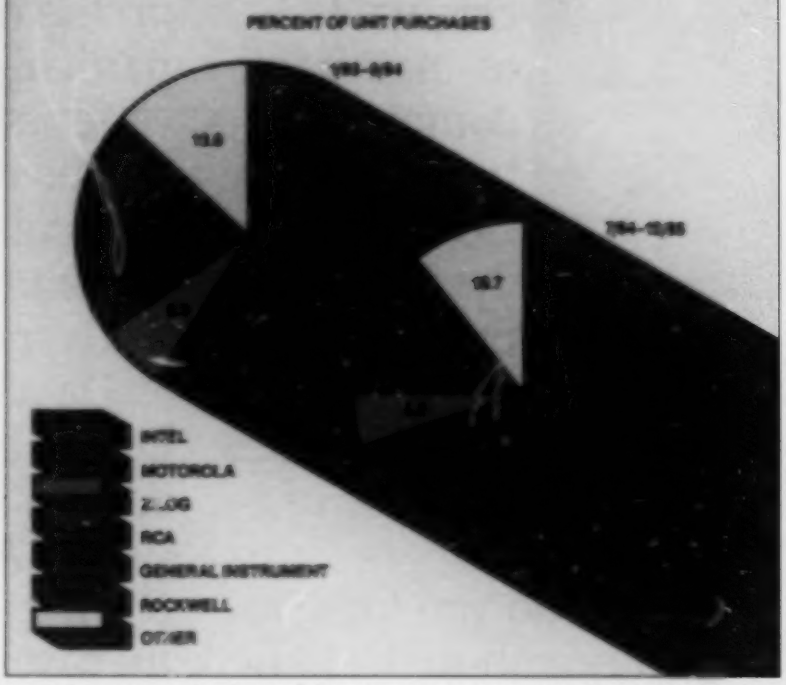
IN FOCUS

FIG. 11

INTEL LEADS IN MICROPROCESSORS



network appears to be ahead of the private branch exchange in popularity among minicomputer users, particularly among defense contractors. This may mean the Defense Department will have a standard-setting influence on this area of data communication.

The Defense Department-dictated Ada language is being used at only 1.7% of all respondent sites, but at 4.3% of DEC sites and 5.2% of defense-oriented sites. By the end of next year, however, those numbers will have grown to 6.6%, 15.9%, and 25%, respectively.

The most popular machine to be acquired by respondents in the coming 18 months should be the DEC VAX 11/750, which is in the purchasing plans of 181 sites.

The AI language Lisp was found to be in use at only 3.7% of all sites, 9.9% of DEC sites, and 19.6% of education sites; by the end of 1985 those numbers are expected to have changed to 6.3%, 15.6%, and 28.2%, respectively.

The fault-tolerant computing market, pioneered by Tandem Computers and now targeted by many recently started companies, is still drawing fairly high interest from users, but that's topping off, Cowen contends. For instance, almost 40% of the respondents said they would not be interested in fault-tolerant systems even if compatible with their current minicomputers; 11% said yes to the same question. This suggests a much narrower market potential than might otherwise appear for new proprietary fault-tolerant systems suppliers.

In the "raw" microcomputer chip arena, where IBM has established itself as a de facto standard, Intel not surprisingly was found to be the leading supplier. Intel, of course, supplies the 8088 and 80286 chips to IBM and many other pc makers. In terms of unit purchases of individual chips, Intel supplied 40% through June 1984, followed by Motorola supplying 19%. As for the following 18 months, Intel is slated to get 47% of the respondent purchases, with Motorola obtaining a 24% share. In both cases, the runners-up were Zilog, RCA, General Instrument, and Rockwell. The 8088, which forms the heart of the IBM PC and its software-compatible clones, accounted for just over 30% of the Intel micro chips respondents will buy through the end of next year; the 8086 has an 18% to 19% share. According to survey results, Motorola should see an ongoing shift by users to its new 68010 and 68020 chips from the 68000. ◉

To order the complete 1984-85 Mini-Micro Survey results for $795, please call Cora Zaboly at (212) 605-9593.

Current users of this technology are early leaders in an area that still offers somewhat limited capabilities.

BUSINESS GRAPHICS TRENDS

by John A. Lehman, Doug Vogel, and Gary Dickson

Computer graphics is forecast as one of the fastest growing areas within the computer industry. Sales of graphics equipment are increasing, national graphics conferences such as ACM's SIGGRAPH and the National Computer Graphics Association's annual meeting are attracting record crowds, and industry pundits are predicting that future computer systems will be graphics-based. The use of computer graphics for managerial communication and analysis, what we shall call "business graphics," is predicted to be one of the major growth areas.

In spite of the outpouring of enthusiasm for computer graphics in general and business graphics in particular, we have little empirical evidence as to how organizations are using business graphics, what they are using them for, and how they anticipate using them. We have initiated a large-scale project, the Minnesota Management Graphics Project, to conduct research in these areas. This article reports the results of a survey that we recently completed to help answer these questions. The survey was intended to ascertain which members of the responding organizations are using business graphics, what they are doing with them, and how they have managed the process.

Our survey had 36 questions. It was pretested on a sample of Twin Cities companies, revised, pretested on a different group of companies, and revised again before being sent out. None of the original respondents were included in the final mailing (although some of the same organizations were represented).

The survey was sent to the dp managers of 789 organizations around the United States. All were members either of the Society for Information Management, Chicago, or affiliates of the Center for the Study of Data Processing at Washington University, St. Louis. The organizations we sent questionnaires to were selected by eliminating individual members, academic institutions, consultants, and other non-institutional users from the lists. We had a 25% response rate; just under 200 questionnaires were completed and returned.

The respondents were predominantly managers (32%), directors (30%), and vice presidents (14%) from MIS/IS, representing corporate headquarters (64%) as opposed to divisions (34%). Most of the responses came from manufacturing organizations (42%), followed by financial services organizations (14%), retailing (6%), and utilities (6%); other services including engineering, transportation, government, education, and communication each made up 5% or less. The responding organizations ranged in size from eight to 200,000, with an average of about 11,000 employees. Full-time employees in the MIS/dp area ranged from zero to 15,000, with an average of about 440.

We identified nine trends that involve:

- technological capabilities
- motivation for use
- functional area use
- end users
- applications profiles
- organizational responsibilities
- user satisfaction
- impediments to increased use
- forecasts for the future

These trends can be divided into four major categories:

- existing situation
- user satisfaction
- impediments to increased use
- the future

The existing situation trends reveal where the respondent organizations stand with respect to technological capability, motivation for use of business graphics, functional areas using business graphics, end-user characteristics, business graphics applications, and responsibility within the organization for computer graphics.

90% HAVE COMPUTER GRAPHICS

Technological capability. The respondent organizations have a strong technical computer capability. Almost 90% of the respondents already have computer graphics capability as well as high levels of other advanced technologies such as databases, interactive debugging, telecommunication, very high level languages, and extensive use of microcomputers. The only technical area in which less than half of the repondents are involved is the ability to link microcomputers to mainframes (other than as dumb terminals).

While most of the respondents have business graphics facilities, almost a third of them have had these facilities for a year or less. Well under half of the respondents have had business graphics facilities for three or more years.

Investment in existing business graphics hardware and software capability is small relative to the size of the organizations and spread over a wide variety of vendors. SAS/GRAPH, from the SAS Institute Inc., Cary, N.C., is the most widely available mainframe package, and Lotus 1-2-3, by Lotus Development Corp., Cambridge, Mass., dominates among the packages that run on microcomputers (Figs. 1 and 2). Personal computers with graphic displays outnumber other graphic devices available in organizations. Respondents generally noted that the few existing graphics workstations were distributed throughout the organization.

Motivation for use. User demand was the major factor influencing the decision to buy computer graphics, followed by a desire to explore use of the technology (Fig. 3). Vendors offering graphics technology at a good price and/or with good support were almost never the major influential factor. Top management was only occasionally the first to voice a need for computer graphics. Graphic arts areas were almost never the first to voice a need.

Functional area use. In most responding organizations, only information systems, finance, and marketing are regular, heavy users of computer graphics. Personnel, operations research/management science, and production are notedly weak users (Figs. 4 and 5). Few functional areas are using graphics simply on a trial basis. Of those that are, information systems, marketing, and accounting predominate, while strategic planning, production, and operations research/management science exhibit little trial use.

End users. Very few end users have business graphics experience. Those who do are generally professionals or managers. In many of the organizations, almost no

FIG. 1

COMPUTER GRAPHICS SOFTWARE AVAILABILITY

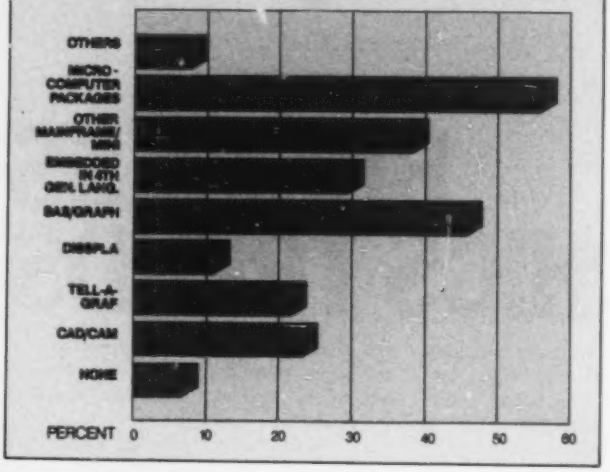


FIG. 2

MICROCOMPUTER SOFTWARE PACKAGES

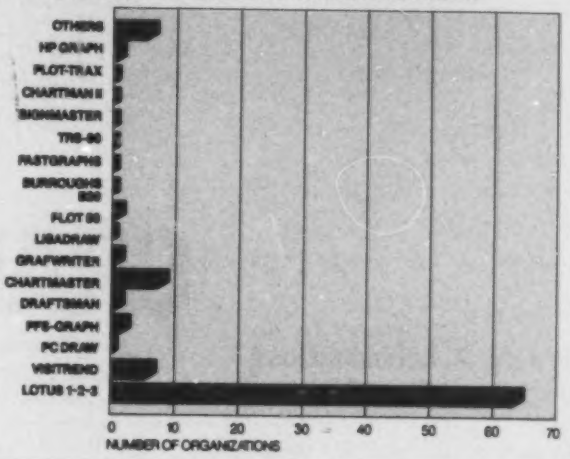


FIG. 3

MAJOR FACTORS INFLUENCING PURCHASE OF GRAPHICS TECHNOLOGY

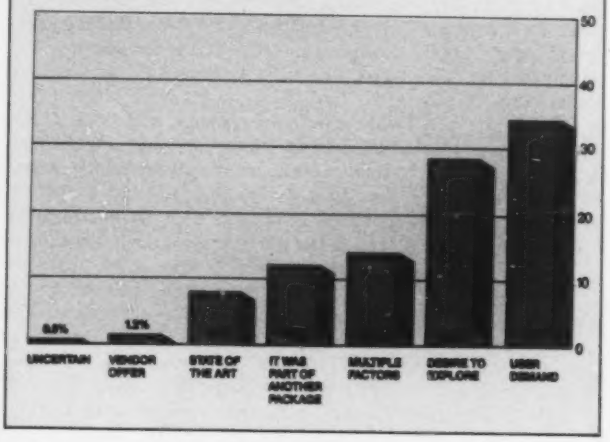


FIG. 4

FIRST IN ORGANIZATION TO VOICE NEED FOR COMPUTER GRAPHICS

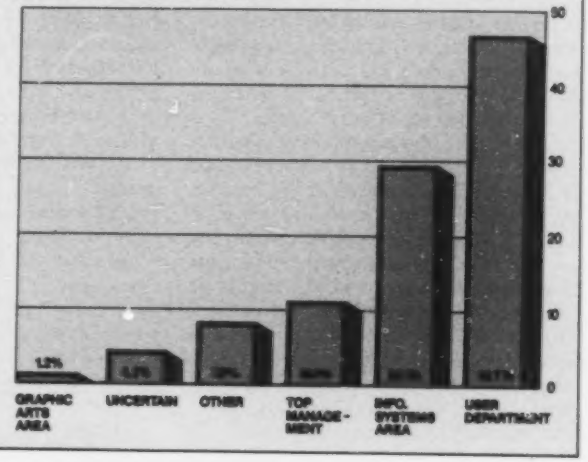


FIG. 5

FUNCTIONAL AREAS USING COMPUTER GRAPHICS

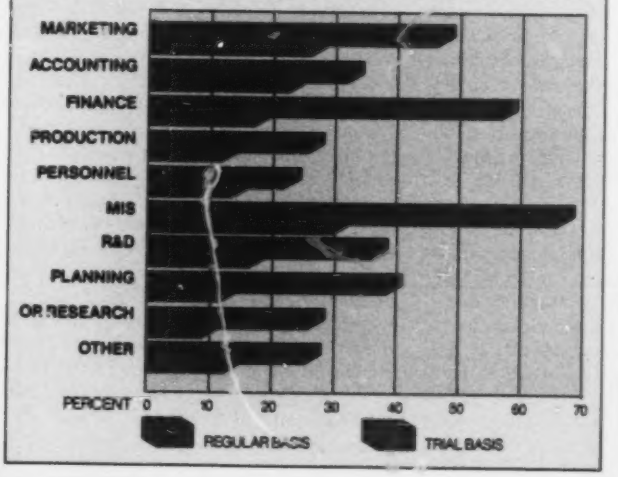


FIG. 6

PERCENT OF INFORMATION SYSTEMS USERS WITH COMPUTER GRAPHICS EXPERIENCE

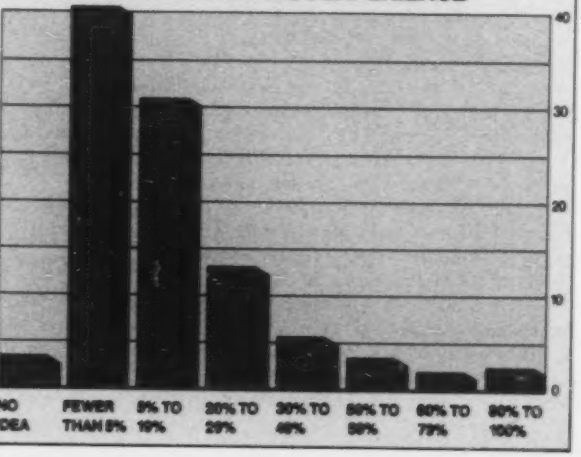


FIG. 7

USE OF GRAPHICS AS A DECISION SUPPORT TOOL

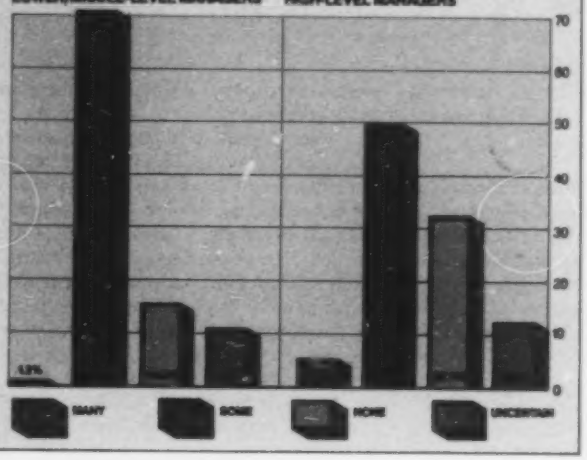


FIG. 8

SUPPORT FOR BUSINESS GRAPHICS

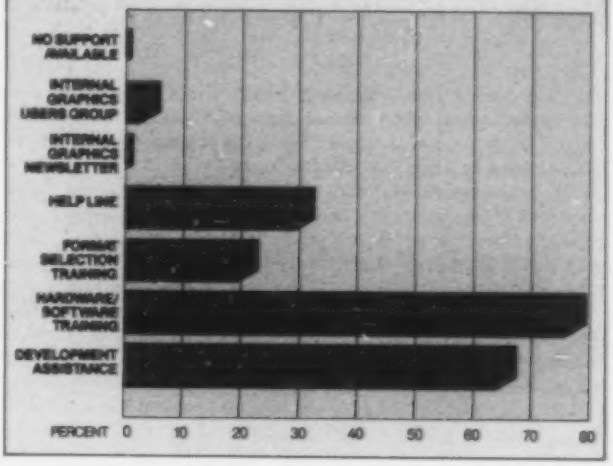


FIG. 9

USER SATISFACTION

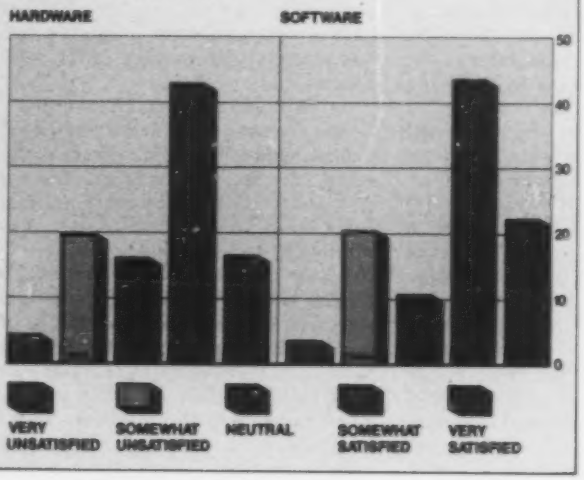


FIG. 10

IMPEDIMENTS TO INCREASED COMPUTER GRAPHICS USE

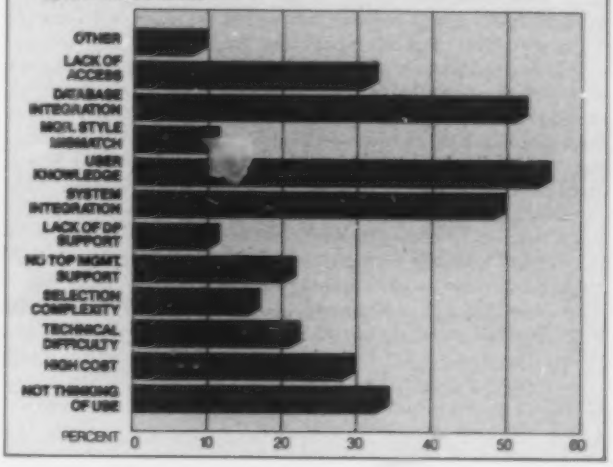


FIG. 11

ANTICIPATED GROWTH OF COMPUTER GRAPHICS FOR BUSINESS APPLICATIONS

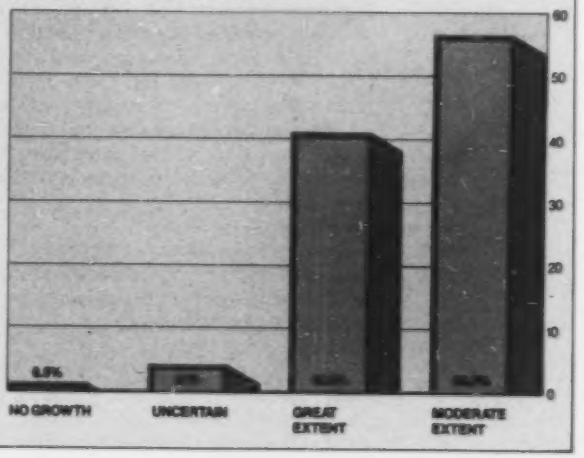
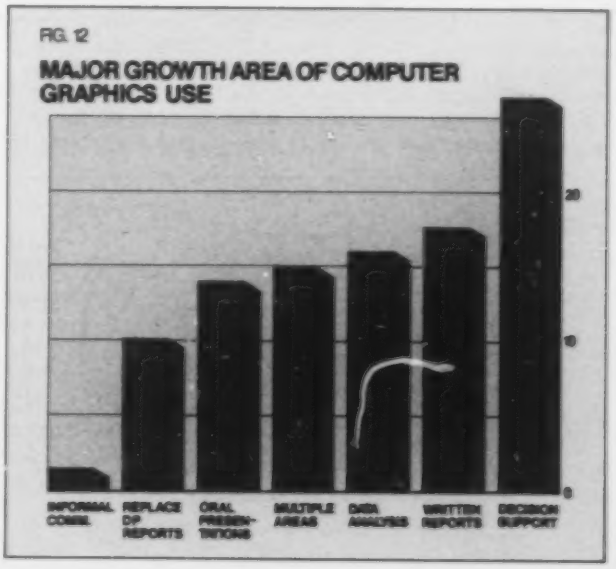


FIG. 12

MAJOR GROWTH AREA OF COMPUTER GRAPHICS USE



The movement of graphics into organizations is like a series of waves. The first has already crashed on the beach.

end users have business graphics experience; organizations where half or more of the end users have such experience are a small minority (Fig. 6). Professionals (34%), managers (23%), and managerial assistants (21%) generally interact with graphics software to develop or print charts and graphs. Executives (9%) generally do not.

Applications profile. In a rank ordering of computer graphics applications, support for written reports and oral presentations slightly outrank data analysis and decision support. Replacing or supplementing standard dp reports and informal communication of ideas rank lowest. Some low- and middle-level managers are using graphics for decision support, but only a handful of high-level managers are doing so (Fig. 7).

Organizational responsibility. Responsibility for computer graphics within the organization resides primarily in the MIS/dp and information center areas (quite often in both). Some of the respondents reported that formal responsibility for computer graphics has not been specified. In a bare majority of the organizations, no support staff is dedicated to computer graphics. Development assistance and training on the specifics of using graphics hardware and software are often provided. Relatively few organizations provide training on the art of selecting and designing charts and even fewer have internal newsletters or user groups (Fig. 8).

User satisfaction. User satisfaction is similar for graphics hardware and software (Fig. 9). In both cases, just under half the users are somewhat satisfied and about a quarter are somewhat dissatisfied. More users of graphics hardware are neutral than are software users. Only a few are very dissatisfied with either hardware or software; about a fifth of the users are very satisfied with both hardware and software. Differences as a result of years of business graphics experience, availability of dedicated support staff, and degree of training and assistance remain to be examined.

USER KNOW-HOW LACKING

Impediments to increased use. Most responding organizations cited insufficient user knowledge and poor integration of computer graphics with databases and other systems as impediments to increased use of computer graphics as a decision-support tool. Roughly one third of the respondent organizations noted that people just don't think of using computer graphics, and that sufficient access to computer graphics was lacking. Fewer organizations noted technical difficulties or lack of top management support as impediments, and even less felt there was a lack of support for computer graphics by the dp area or that computer graphics were inconsistent with managerial style (Fig. 10). Forced to select the major impediment, organizations responses were in about the same order as above.

The future. Most respondents felt that use of computer graphics will increase to a moderate extent and almost half expect it will increase to a great extent (Fig. 11) over the next three years. Three quarters of the organizations expected increases in computer graphics use for decision support, support of written reports, data analysis, and support of oral presentation. Most also foresaw an increase in its use to replace or supplement standard dp reports. A substantial minority expected increased use of computer graphics for informal communication of ideas (Fig. 12). Again, when asked to select the major area of growth in use of computer graphics over the next three years, organizations responded in the same order as above.

Half of the organizations are considering expanded use of business graphics as part of the formal information systems planning process. Only a few (12%), however, have a formal written plan for computer graphics.

Responses to a query concerning what computer graphics features would contribute most to effective future use of the technology were dominated by pleas for integration capability with databases and systems. Ease of use and lower cost, particularly of hardcopy output devices, were noted, as were flexibility and better terminal resolution. Only 2% of the suggestions address graphics standards, which indicates that business users of computer graphics are much less concerned about this issue than the traditional graphics community.

The movement of business graphics into organizations is somewhat like a series of waves. The first has already crashed on the beach. Organizations are increasingly involved in business graphics. The next wave is swelling around integrating business graphics with existing databases and systems.

Still out in the ocean waiting to form is the wave that will introduce a substantial number of organizational personnel to business graphics. Present users are early leaders in areas where existing, somewhat limited capabilities can be used effectively.

As the next step in this research, we shall be carrying out an in-depth follow-up survey to learn more about organizations that heavily use management graphics. In particular, we want to learn more about what specific attributes of business graphics are being used, what attributes relate to successful use, and how present graphics systems should be changed to better accommodate both technical and human factors perspectives.

The results of this inquiry will give direction to forthcoming experimental and field research that is part of the Minnesota Management Graphics Project. These studies are intended to provide prescriptive knowledge about which graphical techniques are best suited for which applications. The series of studies will be coordinated and will use a limited set of dependent variables so that cumulative results can be produced from the individual experiments. ◉

"Dr. Gumer printed my letter, and he referred me to another advice column."

CARTOON BY REX F. MAY

John A. Lehman, assistant professor of MIS, and Gary Dickson, professor of MIS, are both employed at the University of Minnesota's Department of Management Sciences. Doug Vogel is a PhD student at the university. All three are involved in the Minnesota Management Graphics Project, which began in 1983 and will continue for another four or five years.